

# E85 and Flex Fuel Vehicles

California Energy Commission  
Workshop on Opportunities to Expand  
the Use of Alternative Transportation  
Fuels

**July 8, 2005**

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**Representing National Ethanol Vehicle Coalition**



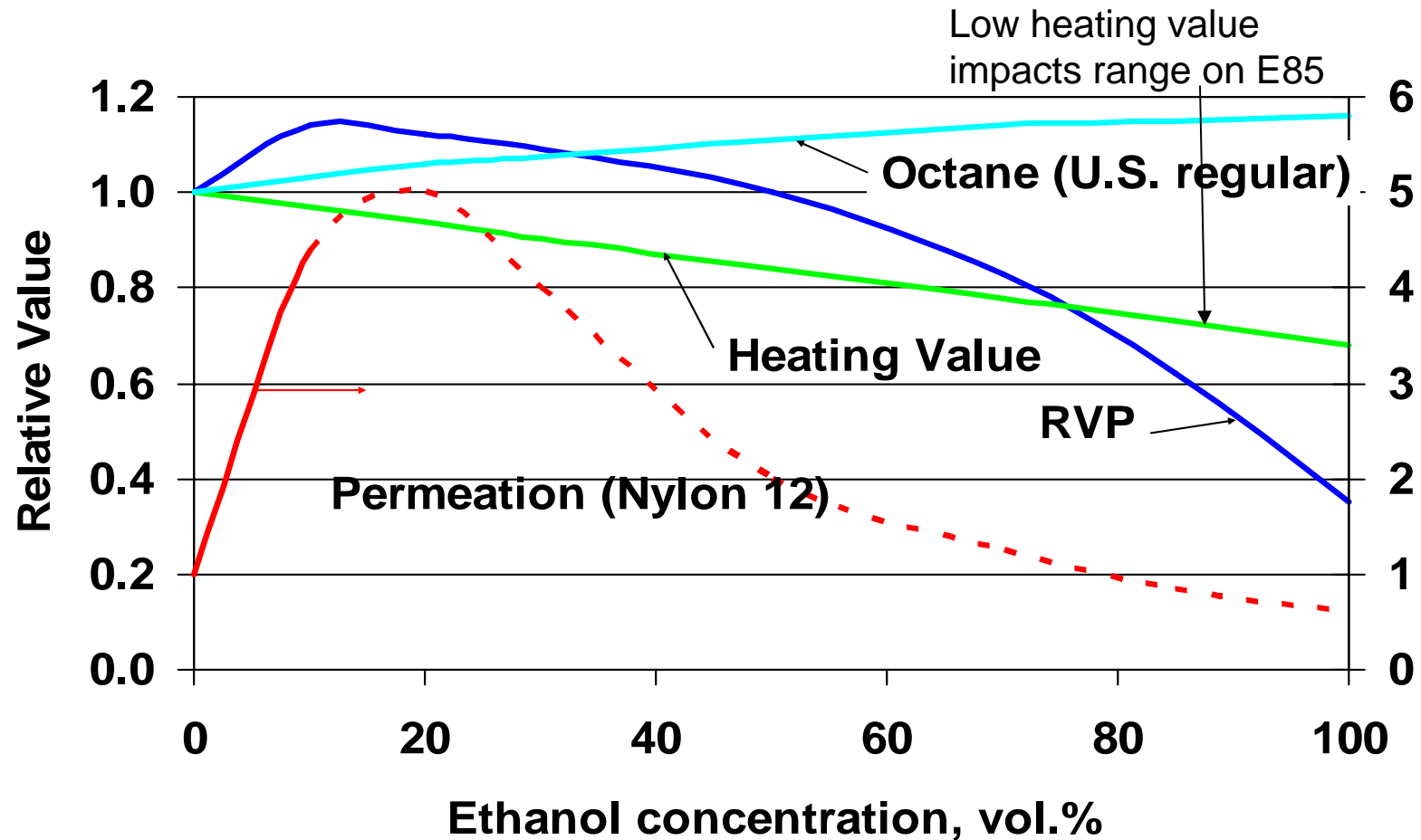
# Background

- **Widespread concerns about greenhouse gas emissions and petroleum fuel use are driving consideration of various alternative fuels**
- **California Energy Commission/Air Resources Board Integrated Energy Policy Report calls for 15% reduction in petroleum fuel use by 2020**
  - **July 2003 report concluded that significant penetration of alternative fuels would be needed**
  - **Final report due November 2005**
- **AB 1493 calls for substantial reductions in vehicle CO2**
  - **In-use fleet: 17% in 2020, 27% in 2030**
  - **New vehicles: 22% in 2012, 30% in 2016**

# Ethanol Use in California

- **Currently more than 900M gallons of ethanol is used in California as 5.7% blends**
- **Renewable Fuel Standard in the energy bill pending in Congress would likely require similar quantities in California**
- **Evaporative emissions due to permeation requires mitigation strategies**
- **Tailpipe NOx emission concerns have limited ethanol blends to 5.7% in California**
  - **CRC “E-67” study will provide data on newer vehicles late Summer 2005**

# Typical Ethanol Impacts on Fuel Properties



Permeation results are illustrative, depend on polymeric material

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- **Ethanol has the potential to address reductions in petroleum fuel use and GHG's proposed in California in the near term. E85 and FFVs maximize the use of ethanol.**
- **Based on technical assessment, permeation evaporative emissions may not be an issue with E85**
  - **CRC "E-65" research due to provide data by December 2005**
- **20% GHG reduction with E85 from corn, 60-65% GHG reduction with cellulose E85\***
- **Research suggests that 25-30% of the US fuel pool could be replaced by ethanol\*\***
- **Currently about 300,000 FFVs estimated in the California in-use fleet, growing at the rate of 50,000 per year.**
- **E85 can be cost competitive to gasoline at \$2.20 per gallon on an energy equivalent basis without subsidies for ethanol.**

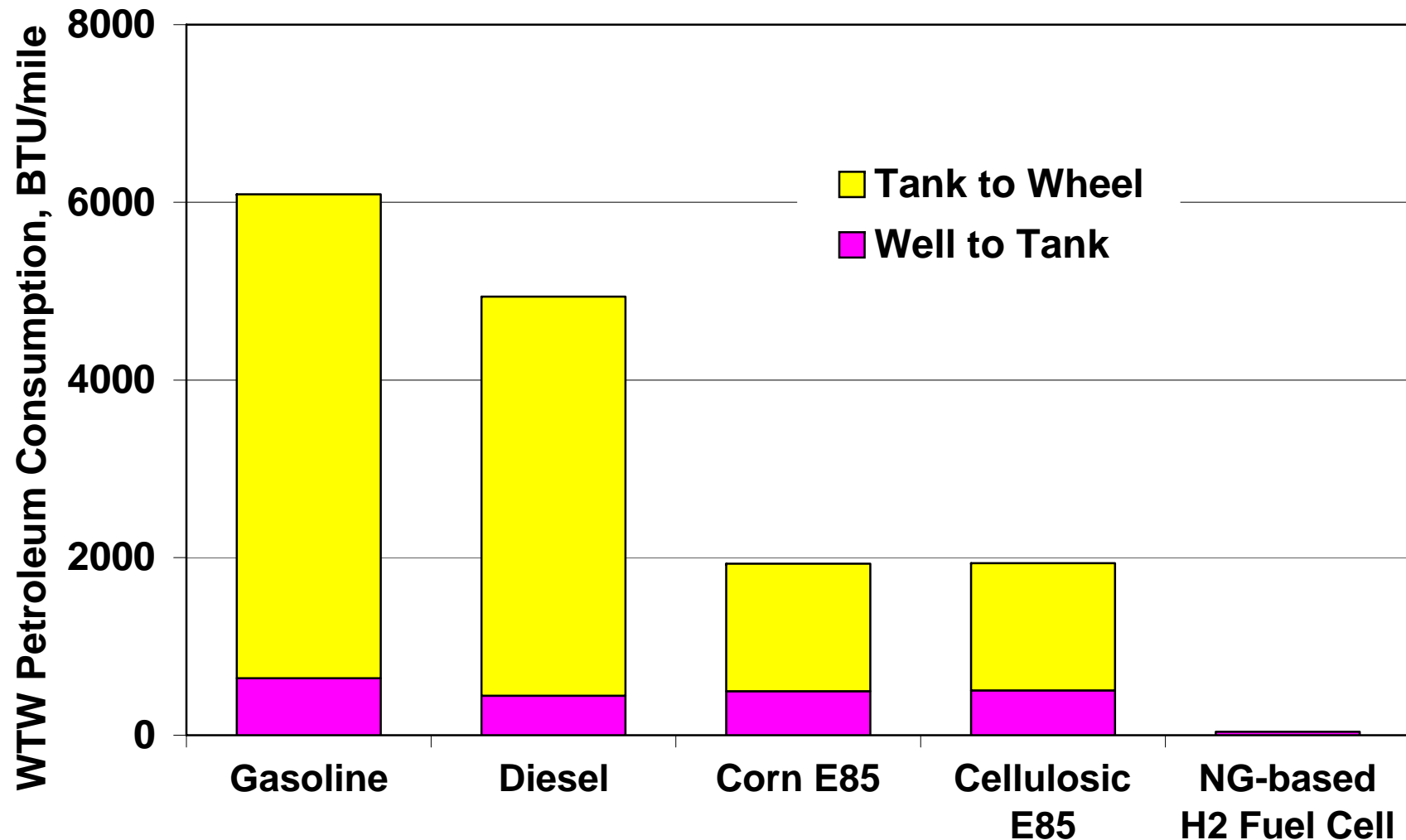
\* "An Update of Energy and Greenhouse Gas Emission Impacts of Fuel Ethanol", Michael Wang, Argonne National Laboratory, February 2005.

\*\* GM/University of Toronto research on cellulose ethanol supply

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# Well-To-Wheel Petroleum Consumption

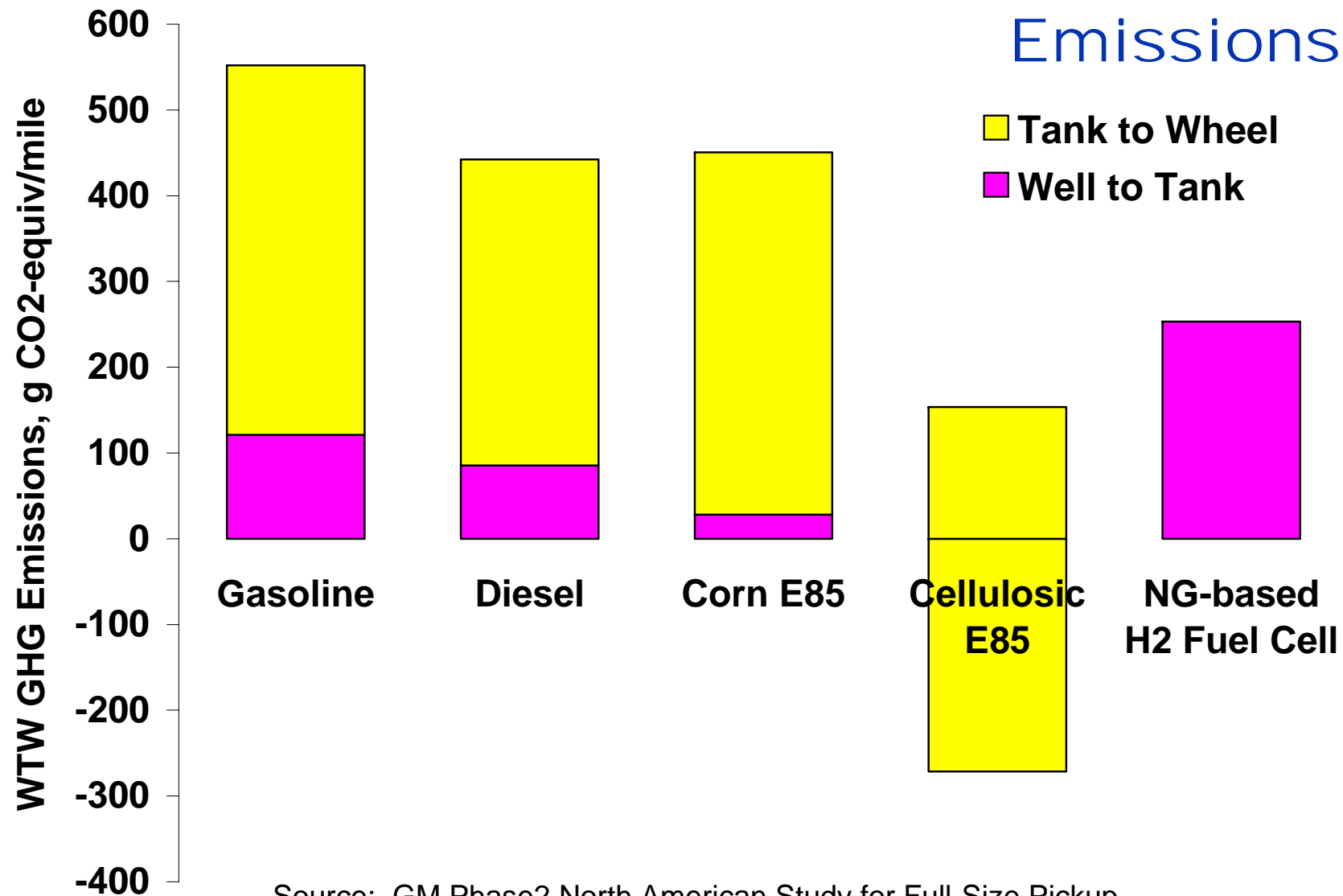


Source: GM Phase2 North American Study for Full-Size Pickup

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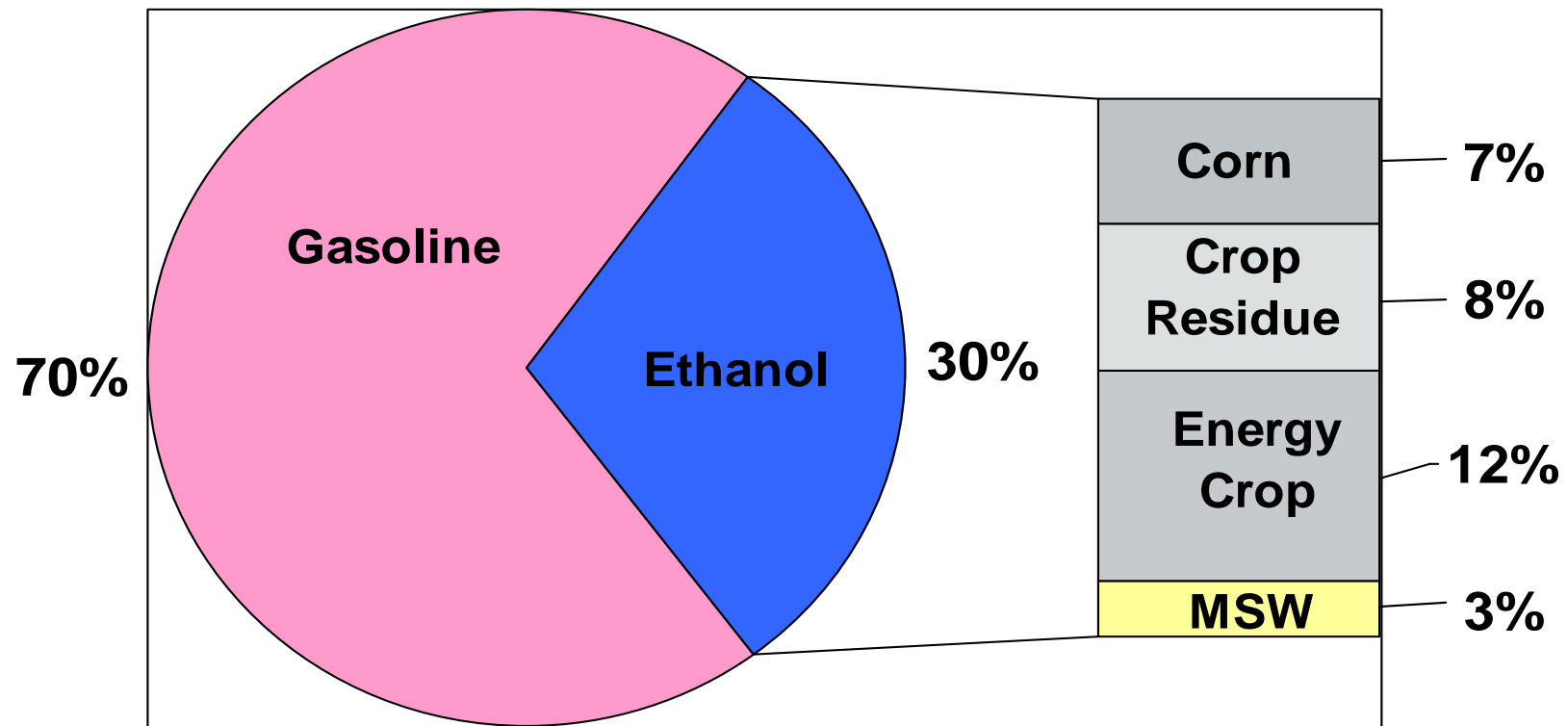
# Well-To-Wheel Greenhouse Gas Emissions



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# Practical Estimate of Potential U.S. Ethanol Portion of U.S. Light-Duty Fuels (Year 2020)



All percentages are on an energy equivalent basis

Source: GM/University of Toronto research on cellulose ethanol supply

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# Barriers to E85 and FFVs

- **Development of E85 infrastructure is currently prohibitively expensive and time consuming**
  - Only one retail outlet in San Diego
  - Enhanced Vapor Recovery requirements
  - Currently only research permits
  - Widespread infrastructure would be needed
- **Supply/availability of ethanol**
  - California would require 3.5B gal of ethanol per year to displace 15% petroleum fuel
  - Production of ethanol from cellulose would be needed to address GHG reduction targets
- **Continued incentives are needed beyond 2008 to insure availability of FFVs**
- **Future California emission requirements are likely to limit the availability of E85 FFVs beyond 2007 as PZEVs are sold to meet the ZEV mandate**
- **Advancements in cellulose ethanol production technology, development of ethanol production in California**
- **Control of criteria pollutant emissions from ethanol production**

## Recommendations to Encourage Increased Use of E85

- **Facilitate state EVR permitting process**
- **State E85 infrastructure incentives**
- **Support for California based cellulose ethanol production**
  - Sponsor research
  - Support pilot plant
- **Support continued national incentives for FFVs**
- **Support tax credits for infrastructure development**

# Summary

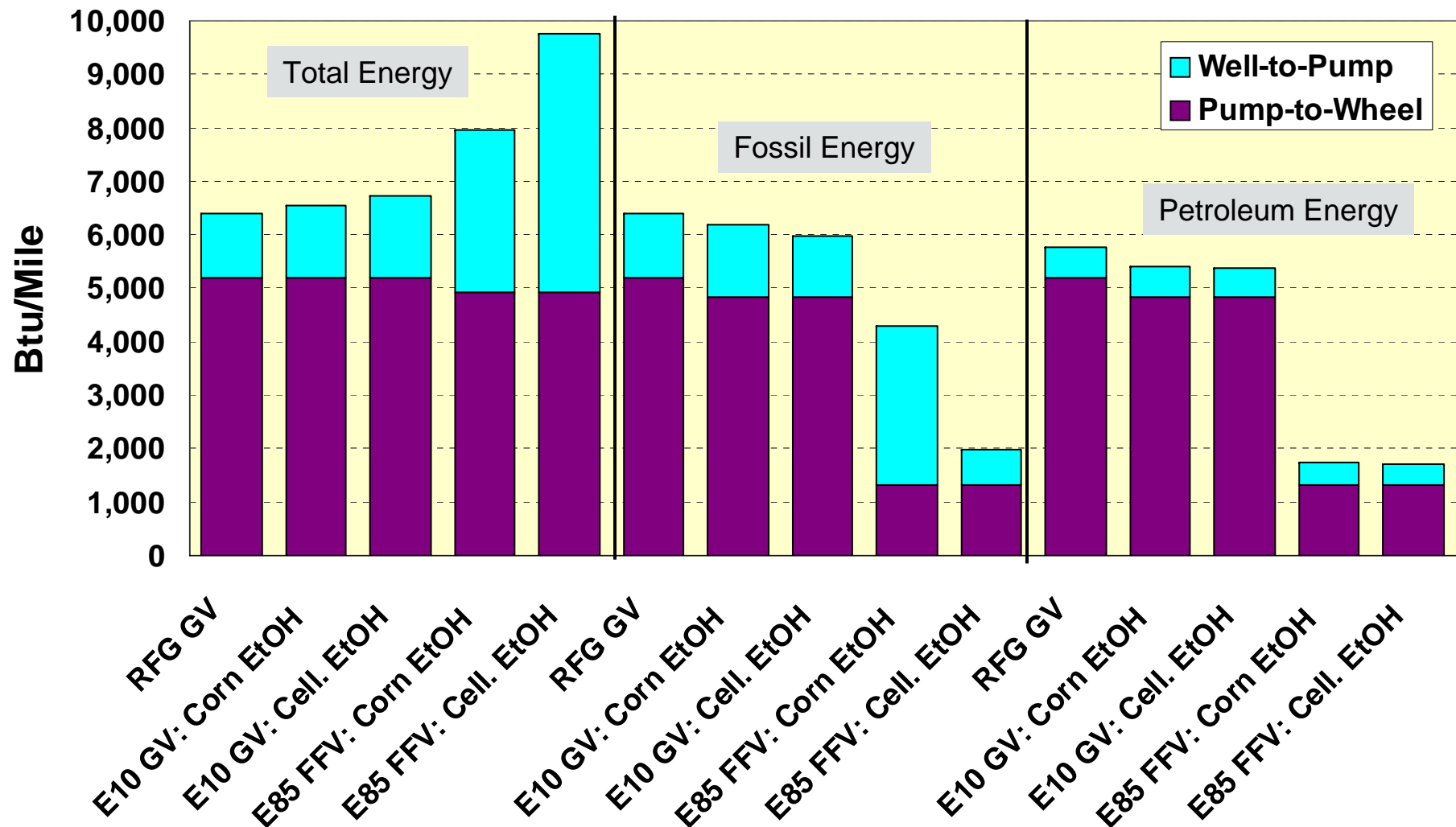
- **E85 represents perhaps the best opportunity to address California goals of reducing petroleum fuel use and greenhouse gas emissions.**
- **Several barriers must be addressed including infrastructure development, increased ethanol supply and FFV availability.**
- **California cellulose ethanol production capability would likely be needed.**
- **Increased use of E85 is at least neutral to air quality, and would likely help to address permeation evaporative emission concerns.**

# Back-up Material

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## Use of Ethanol to Replace Gasoline Results in WTW Energy Benefits

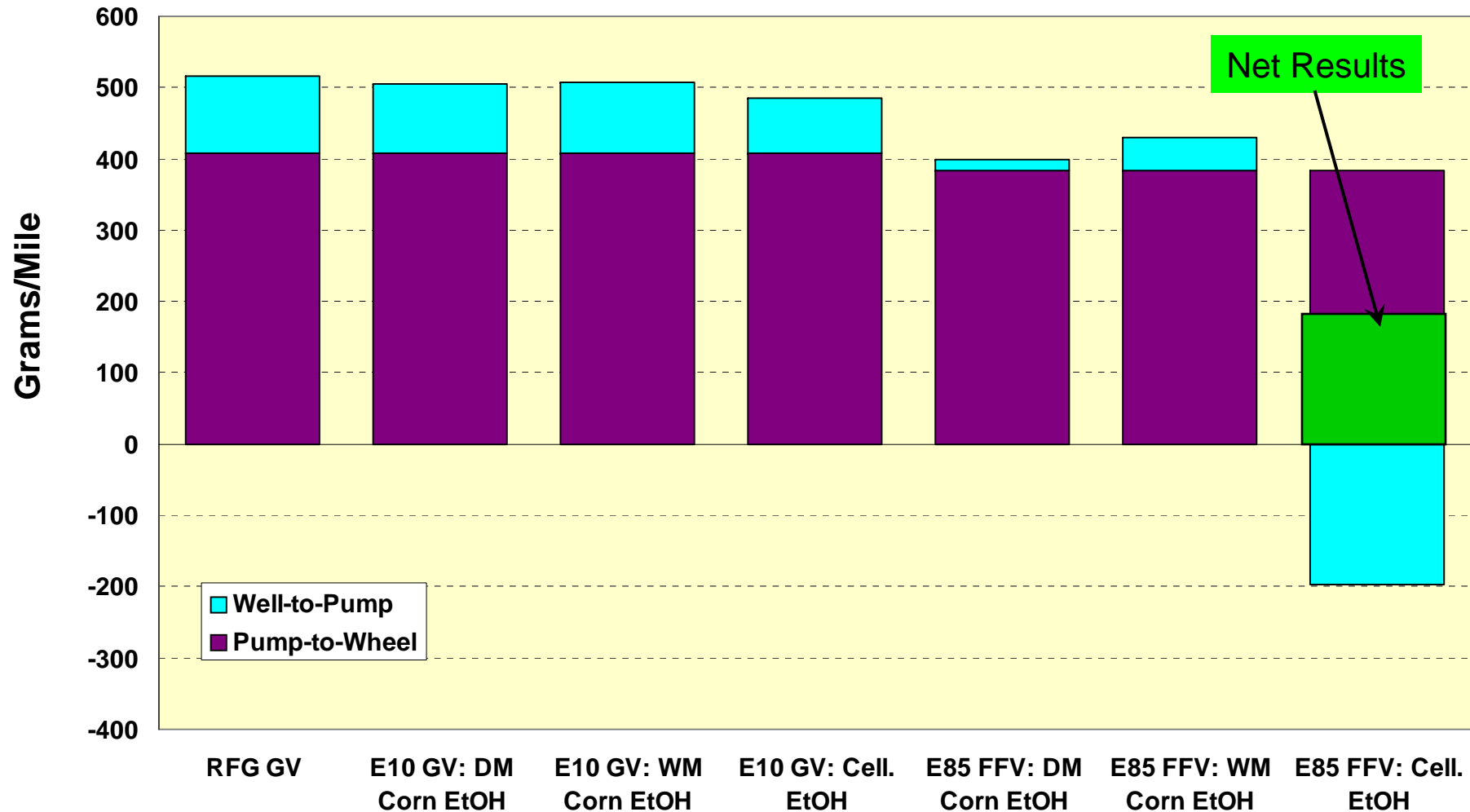


Source: "An Update of Energy and Greenhouse Gas Emission Impacts of Fuel Ethanol", Michael Wang, Argonne National Laboratory, February 2005.

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## Per-Mile GHG Emission Results Show Larger Benefits of E85 and Cellulosic Ethanol

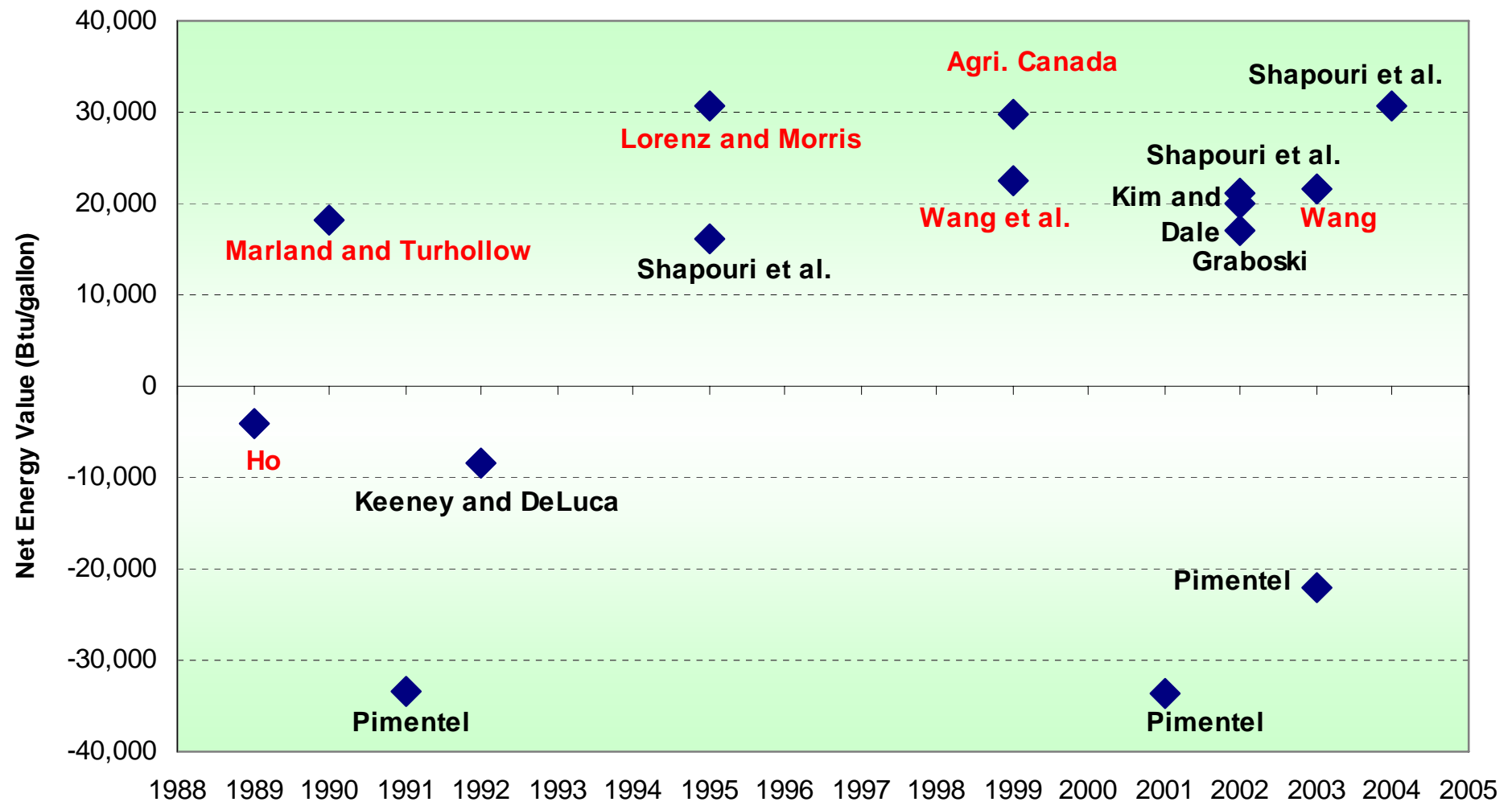


Source: "An Update of Energy and Greenhouse Gas Emission Impacts of Fuel Ethanol", Michael Wang, Argonne National Laboratory, February 2005.

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## Energy Balance of Corn Ethanol Results Among Studies (Based on Fossil Energy Use)



Studies highlighted in red have GHG emission results.

Source: "An Update of Energy and Greenhouse Gas Emission Impacts of Fuel Ethanol", Michael Wang, Argonne National Laboratory, February 2005.

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